Claims

1. A nitride based 3-5 group compound semiconductor light emitting device comprising:

a substrate;

a buffer layer formed above the substrate;

a first In-doped GaN layer formed above the buffer layer;

an $In_xGa_{1-x}N/In_yGa_{1-y}N$ super lattice structure layer formed above the first In-doped GaN layer;

a first electrode contact layer formed above the $In_xGa_{1-x}N/In_yGa_{1-y}N$ super lattice structure layer;

an active layer formed above the first electrode contact layer and functioning to emit light;

a second In-doped GaN layer;

a GaN layer formed above the second In-doped GaN layer; and

a second electrode contact layer formed above the GaN layer.

2. The device according to claim 1, wherein the second electrode contact layer is an n-type electrode contact layer.

3. The device according to claim 1, wherein the buffer layer comprises one selected from the group consisting of an InGaN/GaN super lattice structure, an $In_xGa_{1-x}N/GaN$ structure and an $Al_xIn_yGa_{1-x,y}N/In_xGa_{1-x}N/GaN$ structure.

4. The device according to claim 1, wherein the first electrode contact layer comprises a Si/In-codoped GaN layer.

5. The device according to claim 1, wherein the active layer comprises a single or multiple quantum well structure.

6. The device according to claim 1, wherein the active layer comprises a single or multiple quantum well structure, including a low mole In-doped $In_xGa_{1-x}N$ layer, an $In_yGa_{1-y}N$

well layer and an $In_zGa_{1-z}N$ barrier layer.

7. The device according to claim 6, wherein the low mole In-doped $In_xGa_{1-x}N$ layer has an In content smaller than that of the $In_zGa_{1-z}N$ barrier layer.

8. The device according to claim 6, wherein the low mole In-doped $In_xGa_{1-x}N$ layer, the $In_yGa_{1-y}N$ well layer and the $In_zGa_{1-z}N$ barrier layer have an In content expressed as $0 < x < 0.05$, $0 < y < 0.3$ and $0 < z < 0.1$, respectively.

9. The device according to claim 6, wherein the low mole In-doped $In_xGa_{1-x}N$ layer has a surface configuration that is grown in a spiral mode.

10. The device according to claim 6, wherein the low mole In-doped $In_xGa_{1-x}N$ layer has a surface configuration that is grown in a spiral mode, and wherein the spiral mode is extended to the surface of the $In_zGa_{1-z}N$ barrier layer.

11. The device according to claim 1, wherein the second electrode contact layer comprises an $In_xGa_{1-x}N/In_yGa_{1-y}N$ super lattice structure.

12. The device according to claim 1, wherein the low mole In-doped $In_xGa_{1-x}N$ layer and the $In_xGa_{1-x}N/In_yGa_{1-y}N$ super lattice structure layer formed thereon are repeatedly layered in plurality.

13. A nitride based 3-5 group compound semiconductor light emitting device comprising:

a substrate;

a buffer layer formed above the substrate;

a first In-doped GaN layer formed above the buffer layer;

a first electrode contact layer formed above the first In-doped GaN layer;

an active layer formed above the first electrode contact layer and functioning to emit light;

a GaN layer formed above the active layer; and

a second electrode contact layer formed above the GaN layer.

14. The device according to claim 13, wherein the second electrode contact layer is an n-type electrode contact layer.

15. The device according to claim 13, further comprising a second In-doped GaN layer formed between the active layer and the p-type GaN layer.

16. The device according to claim 13, further comprising an $In_xGa_{1-x}N/In_yGa_{1-y}N$ super lattice structure layer formed between the first In-doped GaN layer and the first electrode contact layer.

17. The device according to claim 13, further comprising an $In_xGa_{1-x}N/In_yGa_{1-y}N$ super lattice structure and an undoped GaN layer between the first In-doped GaN layer and the first electrode contact layer.

18. The device according to claim 13, wherein the buffer layer comprises one selected from the group consisting of an InGaN/GaN super lattice structure, $In_xGa_{1-x}N/GaN$ structure and an $Al_xIn_yGa_{1-x,y}N/In_xGa_{1-x}N/GaN$ structure.

19. The device according to claim 13, wherein the first electrode contact layer comprises a Si/In-codoped GaN layer.

20. The device according to claim 13, wherein the active layer comprises a single or multiple quantum well structure.

21. The device according to claim 13, wherein the active layer comprises a single or multiple quantum well structure, including a low mole In-doped $In_xGa_{1-x}N$ layer, an $In_yGa_{1-y}N$ well layer and an $In_zGa_{1-z}N$ barrier layer.

22. The device according to claim 21, wherein the low mole In-doped $In_xGa_{1-x}N$ layer has an In content smaller than that of the $In_zGa_{1-z}N$ barrier layer.

23. The device according to claim 21, wherein the low mole In-doped $In_xGa_{1-x}N$ layer, the $In_yGa_{1-y}N$ well layer and the $In_zGa_{1-z}N$ barrier layer have an In content expressed as $0 < x < 0.05$, $0 < y < 0.3$ and $0 < z < 0.1$, respectively.

24. The device according to claim 21, wherein the low mole In-doped $In_xGa_{1-x}N$ layer has a surface configuration that is grown in a spiral mode.

25. The device according to claim 21, wherein the low mole In-doped $In_xGa_{1-x}N$ layer has a surface configuration that is grown in a spiral mode, and wherein the spiral mode is extended to the surface of the $In_zGa_{1-z}N$ barrier layer.

26. The device according to claim 13, wherein the second electrode contact layer comprises an $In_xGa_{1-x}N/In_yGa_{1-y}N$ super lattice structure.

27. A fabrication method of a nitride based 3-5 group compound semiconductor light emitting device, comprising:

forming a buffer layer above a substrate;

forming a first In-doped GaN layer above the buffer layer;

forming a first electrode contact layer above the first In-doped GaN layer;

forming an active layer for emitting light above the first electrode contact layer;

forming a GaN layer above the active layer; and

forming a second electrode contact layer above the GaN layer.

28. The fabrication method according to claim 27, wherein the second electrode contact layer is an n-type electrode contact layer.

29. The fabrication method according to claim 27, wherein the first electrode contact layer comprises a Si/In-codoped GaN layer.

30. The fabrication method according to claim 27, wherein the second electrode contact layer comprises an $In_xGa_{1-x}N/In_yGa_{1-y}N$ super lattice structure layer.

31. The fabrication method according to claim 27, wherein the active layer comprises a single or multiple quantum well structure, including a low mole In-doped $In_xGa_{1-x}N$ layer, an $In_yGa_{1-y}N$ well layer and an $In_zGa_{1-z}N$ barrier layer.

32. The fabrication method according to claim 31, wherein the low mole In-doped $In_xGa_{1-x}N$ layer is grown to have a surface configuration in a spiral mode.

33. The fabrication method according to claim 31, wherein the low mole In-doped $In_xGa_{1-x}N$ layer is grown into a surface configuration of a spiral mode, wherein the spiral mode is extended to the surface of the $In_zGa_{1-z}N$ barrier layer.

34. A nitride based 3-5 group compound semiconductor light emitting device comprising:

a substrate;

a buffer layer formed above the substrate;

a first electrode contact layer formed above the GaN

buffer layer;

an active layer formed above the first electrode contact layer, and including a low mole In-doped $In_xGa_{1-x}N$ layer, an $In_yGa_{1-y}N$ well layer and an $In_zGa_{1-z}N$ barrier layer;

a GaN layer formed above the active layer; and

a second electrode contact layer formed above the GaN layer.

35. The device according to claim 34, wherein the second electrode contact layer is an n-type electrode contact layer.

36. The device according to claim 34, wherein the low mole In-doped $In_xGa_{1-x}N$ layer has an In content smaller than that of the $In_zGa_{1-z}N$ barrier layer.

37. The device according to claim 34, wherein the low mole In-doped $In_xGa_{1-x}N$ layer, the $In_yGa_{1-y}N$ well layer and the $In_zGa_{1-z}N$ barrier layer have an In content expressed as $0 < x < 0.05$, $0 < y < 0.3$ and $0 < z < 0.1$, respectively.

38. The device according to claim 34, wherein the low mole In-doped $In_xGa_{1-x}N$ layer has a surface configuration that is grown in a spiral mode.

39. The device according to claim 34, wherein the low mole In-doped $In_xGa_{1-x}N$ layer has a surface configuration that is grown in a spiral mode, wherein the spiral mode is extended to the surface of the $In_zGa_{1-z}N$ barrier layer.